

make correction

Aphanitic quartz latite flows, in thin section, show snowflake texture with quartz predominantly 0.3-0.4 mm across enclosing brown feldspars; about 10 percent opaque mineral 0.02-0.1 mm across and about 10 percent chlorite. Porphyritic quartz latite contains 10-20 percent plagioclase phenocrysts, about 5 percent opaque phenocrysts, and less than 1 percent quartz phenocrysts. Matrix recrystallized, generally in snowflake texture of intergrowths of quartz and feldspar, but some has dark-brown matrix containing aligned feldspar microlites. Feldspar phenocrysts rounded, corroded, and contain patches of albite, chlorite, and epidote. Upper part concealed by glacial deposits; inferred to be intermediate and felsic volcanic rocks on basis of magnetic properties and rocks on strike to west. Unconformable beneath Jacobsville(?). Total thickness about 20,000 ft

**Y<sub>1</sub>** SIEMENS CREEK FORMATION (PRECAMBRIAN Y)--Predominantly massive, uniform-appearing greenish fine-grained lava flows that were extruded subaerially. Flows are basalt based on thin-section petrography; normative compositions are basalt, trachyandesite, and rhyodacite. Average flow about 9 ft thick; thickest flow 45 ft thick; about 15 percent more than 20 ft thick, more than half less than 5 ft thick, and fewer than 5 percent less than 1 ft thick. Smoothly undulating pahoehoe-type tops with 1-3 in. relief in 10 ft of strike length; no fragmental tops noted. Flows appear welded together but flow surfaces are well preserved and are parting surfaces. Rinds of brownish fine-grained rock  $\frac{1}{4}$  to  $\frac{3}{8}$  in. thick at most flow tops and bottoms. Tops contain less than 5 percent vesicles, generally filled with chlorite, but some filled with quartz, epidote, chlorite, and rare pumpellyite and chalcodony. Sparse pipe vesicles up to 4 in. long at base of a few flows, generally filled with quartz and epidote. The lower half of the next to the lowest flow (about 40 ft thick) is pillowed; pillows generally elliptical and 6 in. to a ft across, but rare ones rod shaped and as much as 10 ft long; pillows less common upward; upper part of flow massive. Locally flow deformed underlying sandstone, suggesting that flow was deposited in shallow water and on poorly indurated sandstone.

Basalt olive-gray to dark greenish; mottled with irregular patches of chlorite, generally less than 1/8 in. across but ranging to 3/8 in.; some basalt in upper half of unit is grayish purple. Porphyritic rocks contain plagioclase phenocrysts 0.4 to 1 mm long; one porphyritic flow chemically analyzed and is rhyodacite. Porphyritic flows well exposed in quarry north of Bessemer and about 2 mi east of the Ironwood area on the south side of a quarry just west of State Highway N-26 and about 0.2 mi north of <sup>well exposed</sup> (NE  $\frac{1}{4}$  sec. 9, T. 47 N., R. 45 W.). In natural exposures, porphyritic flows are difficult to recognize because the greenish feldspars blend in with the lichen-covered rock.

Source of the flows was to the south and most of depositional basin was to the south. Three dikes of basalt cut the basal part of the formation, one in the quarry north of Bessemer and the other in a small valley east of the Grandview Hospital (center of sec. 7, T. 47 N., R. 46 W.). The dike north of Bessemer has a reversed magnetic polarization and cuts through at least 1,000 ft of rock that has normal magnetic polarization (K. G. Books, oral commun., 1969).

**rock**  
Nearly all holocrystalline with a subophitic or diabase to intersertal texture; a few rocks between 1,500 and 3,000 ft above the base are porphyritic with intersertal to trachytic textures. Plagioclase laths (0.07-0.04 mm long, generally less than 0.2 mm long) form about half the rock; clinopyroxene, 10-20 percent; chlorite, 3-10 percent; magnetite and leucosene, 7-22 percent; and epidote, 4-10 percent; apatite and interstitial albite and quartz occur in a few thin sections. Plagioclase and pyroxene crushed, and plagioclase greatly clouded because of alteration to fine granular epidote and unidentified very fine grained minerals. Compositions of plagioclase (determined by extinction angles) An<sub>48</sub>-20\*

Relationship to Kallander Creek uncertain. Contact placed at a diorite sill, following Gordon (1907, p. 457-458), because a lithologic change occurs here; basalts to the north are finer grained and contain less chlorite than those south of sill. Exposures are poor and very sparse near the contact. Rocks north of sill dip as much as 15° more steeply than those to south. Thickness about 4,400 ft

**Y<sub>2</sub>** BESSEMER SANDSTONE (PRECAMBRIAN Y)--Predominantly moderate-red to pale-reddish-brown; finer grained beds light-brownish gray and light gray to medium-dark gray. Contains thin layers of crossbedded quartzite interbedded with laminated quartzite. Quartzite composed of subangular to subrounded quartz grains in a very fine grained, optically unidentifiable matrix. Matrix not conspicuous in outcrop but forms 35-60 percent of rock in thin section. Eleven thin sections contain 95-100 percent sand-sized quartz grains, 0-1 percent feldspar, and 0-4 percent lithic fragments. Quartz has secondary overgrowths of quartz. Rock well cemented and commonly fractures across grains. Lower contact with Tyler Formation (Precambrian W) is a major unconformity, but the two formations are almost concordant (Van Hise and Leith, 1911, p. 378). This contact is not exposed in the Ironwood area, but a basal conglomerate in the Bessemer was reported by Winchell (1895, p. 158), who described a conglomerate of iron ore beneath at least 235 ft of quartzite and sandstone in the SW  $\frac{1}{4}$  sec. 10, T. 47 N., R. 46 W. Upper contact conformable; locally Bessemer-type sandstones are interbedded with Siemens Creek flows (e.g., on south-facing bluff of NW  $\frac{1}{4}$  sec. 10, T. 47 N., R. 46 W., and the south side of the hill in NW  $\frac{1}{4}$  sec. 12, T. 47 N., R. 47 W.). Unit about 300 ft thick

**Y<sub>3</sub>** DIORITE 1 (PRECAMBRIAN Y)--Medium- to coarse-grained diorite composed of andesine (about An<sub>40</sub>), pyroxene, and ilmenite. Other minerals include amphibole, which replaces some pyroxene, and chlorite. Hypidiomorphic granular texture. Diorite on Montreal River has myrmekite intergrowths at ends of some feldspar crystals. <sup>Varies</sup> from 1.5 to 6 mm in length

**Y<sub>4</sub>** DIORITE 2 (PRECAMBRIAN Y)--Medium- to coarse-grained diorite composed of andesine, pyroxene, and ilmenite. Andesite about An<sub>45</sub>, forms poikilitic crystals as much as 25 mm across. Modal composition syenodiorite

#### SYMBOLS

**O** Bedrock outcrop or area of abundant outcrops. Rock type of some outcrops in the unnamed formation and Portage Lake Volcanics are given; c, conglomerate; f, felsite; s, sandstone

--- 7-2-  
Contact  
approximately located, *ground surface*  
---  
Fault  
approximately located  
--- 44  
Strike and dip of beds

U. S. Geological Survey  
OPEN FILE REPORT 75-152  
This report is preliminary and has  
not been edited or reviewed for  
conformity with Geological Survey  
standards or nomenclature.

